REMARKS

Claims 1-5, 8-11, 13-17 and 19-23 are all the claims pending in the application. Applicants cancel claims 6, 12 and 18, and add claims 21-23 by way of this Amendment.

Claims 1-3 are rejected under 35 U.S.C. § 102(b) as being anticipated by Hisajima et al. (5,577,555).

Claims 1-5, 8-11, 14-17 and 20 are rejected under 35 U.S.C. § 102(b) as being anticipated by Rhodes (4,470,452).

Claims 6, 7, 12, 13, 18 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rhodes (4,470,452).

Analysis

Claims 1, 9 and 15 are in independent form; therefore, the following discussion is initially directed to these independent claims.

Each of these independent claims has been amended to include the subject matter of claims 6, 12 and 18, respectively. In particular, the claims now recite that a bead height e with respect to an inner diameter D of the tube is set at e = 0.05D to 0.2D and a bead pitch P with respect to the bead height e is set at P = 6e to 25e.

The Examiner asserts that these relative dimensions would have been obvious because Applicants have not disclosed that these characteristics provide an advantage, are used for a particular purpose, or solve a stated problem. However, as discussed in the specification (page 17), the relative diameter, height and pitch provide an advantage of enhancing the heat radiating

performance. Also, the disclosed dimensions solve the stated problem of pressure loss, by reducing such pressure loss of exhaust gas passing in the tube.

According to MPEP § 2144.05, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. See also, *In re Antonie*.[1]

There is no teaching or discussion in any of the cited references, that the relationship between the inner diameter of the tube should be varied in accordance with the bead height, which is to be set in accordance with the bead pitch. There is no suggestion of a particular result that would be achieved by the recited relationships, and thus, there is no support for asserting that it would have been a matter of obvious design choice to select the relative dimensions now recited in claims 1, 9 and 15.

Applicants note that the present invention, in principle, provides protrusions on the circumference of the inner surface of the tube and enhances the heat radiating performance. In the present invention, the flow of the tube separates at the protrusions, and then reattaches to the tube. The heat radiating performance is enhanced in the reattachment point. The reattachment point is at six to ten times the length (in an axial direction) of the height of the protrusion, and a flat surface is required at the backside of the protrusion. A certain length in a circumference direction should be provided to the protrusion.

[1] 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

On the contrary, Hisajima (US 5,577,555) fails to use such a separation and reattachment feature. In fact, Hisajima provides a plurality of dents in an axial direction continuously as shown in Fig. 34. Thus, Applicants submit that Hisajima is completely different from the claimed invention.

Regarding Rhodes (US 4,470,452), Applicants submit the tube of the Rhodes is completely different from the claimed tube. According to col. 5, lines 5-19 and lines 28-36, Rhodes discloses a flat tube having four portions; a first principal heat transfer surface (120) and a second principal heat transfer surface (122), both of which have a first edge (124) and a second edge (126). Further, Rhodes provides a protrusion only on the first principal heat transfer surface and the second principal heat transfer surface (please see Fig. 5). Moreover, according to Figs. 3 and 6, the protrusions on the first principal heat transfer surface and the second principal heat transfer surface are provided alternately. This is because Rhodes discloses the flat tube. In such a flat tube, the distance between the upper side surface (e.g. the first principal heat transfer surface) and the lower surface (e.g. the second principal heat transfer surface) is too narrow to provide the protrusions facing each other.

On the other hand, the present invention uses the circular tube (contrary to the flat tube of Rhodes) and sets the height of the protrusion at an appropriate value to accelerate the flow, thereby enhancing the heat radiating performance. Further, the claimed invention divides, rearranges or inclines such protrusions to generate the flow along the protrusions. When such flow mixes with the separation and reattachment flow, a complicated flow can be induced. According thereto, the pressure loss can be effectively reduced and the heat radiating

performance can be enhanced. Applicants submit that the flat tube of Rhodes cannot obtain such a feature.

In view of the foregoing, Applicants respectfully submit that claims 1, 9 and 15 are not anticipated or rendered obvious by any of the cited references, whether taken alone or in combination.

The remaining rejections are directed to the dependent claims. These claims are patentable for at least the same reasons as claims 1, 9 and 15, by virtue of their dependency therefrom.

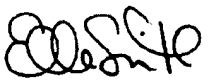
Finally, Applicants add claims 21 to 23 to further define the invention. Specifically, these claims are directed to the structure of the inner surface of the tube. These claims are patentable at least by virtue of their dependency from claims 1, 9 and 15.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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